

AD A109107

DELAWARE RIVER BASIN
ROCKY RUN
PENNSYLVANIA

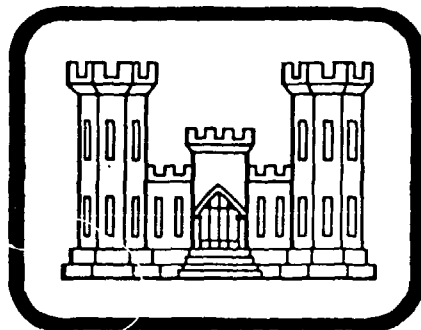
NDI ID PA 00774
PA DER 45-136

LEVEL II

HUNTER LAKE DAM

OWNED BY
THE GOLDEN SLIPPER SQUARE CLUB
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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PREPARED FOR
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND
21203



BY
O'BRIEN & GERE

PHILADELPHIA, PENNSYLVANIA
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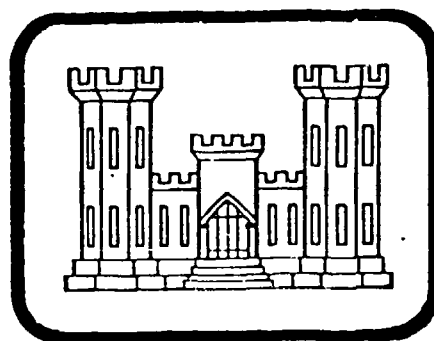
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HUNTER LAKE DAM
PENNSYLVANIA

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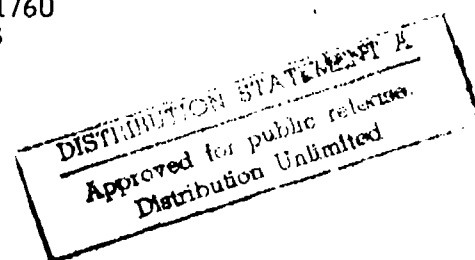
Prepared for:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by:

O'BRIEN & GERE ENGINEERS, INC.
1617 J F Kennedy Boulevard - Suite 1760
Philadelphia, Pennsylvania 19103

August 1981



PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Hunter Lake Dam
State Located:	Pennsylvania
County Located:	Monroe
Stream:	Rocky Run
Coordinates:	Latitude 41° 00.5', Longitude 75° 18.5'
Date of Inspection:	May 13, 1981

ASSESSMENT

Hunter Lake Dam is an earth embankment with a sheet timber core about 300 feet long and 13 feet high. The embankment has a top width of 42 feet and downstream and upstream slopes of 2H:1V and 1H:1V, respectively. The dam was constructed in 1928-29 to provide a lake for recreational purposes.

The dam impounds a reservoir with a normal pool surface area of 17 acres and a maximum storage at the low point of the top of the dam of 126 acre-feet. The ungated concrete overflow spillway, located adjacent to the right abutment, is 57 feet long with a crest elevation about 3 feet below the top of the dam.

Hunter Lake Dam is a "Small" size, "Significant" hazard structure. The recommended Spillway Design Flood (SDF) for a "Small" size, "Significant" hazard dam ranges from the 100 year flood to one-half of the Probable Maximum Flood (PMF). The SDF chosen is the 100 year flood. The spillway is not capable of passing the 100 year flood without the dam being overtopped. The spillway is, therefore, classified as "Inadequate".

Based on the visual observations, discussions with the Owner's representative, and information obtained from the Pennsylvania Department of Environmental Resources, Division of Dam Safety, Hunter Lake Dam is considered to be in fair condition.

Recommendations and Remedial Measures

The following recommendations and remedial measures should be initiated immediately.

a. Facilities

The Owner should retain the services of a licensed professional engineer experienced in the design and construction of dams to assist in the implementation of the following recommendations:

HUNTER LAKE DAM
NDI PA 00774
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1. Provision should be made for reservoir drawdown and the condition of the existing reservoir drain should be investigated.
2. Suitable upstream slope protection should be established and maintained.
3. Measures should be taken to increase the spillway capacity to pass the 100 year flood.

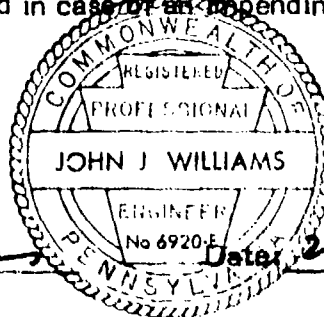
The Owner should initiate the following remedial measures:

1. The upstream face and crest of the embankment should be cleared of all trees.
2. The seepage at the downstream toe of the embankment should be observed regularly for indications of a change in flow rate and/or turbidity.
3. The downstream face of the dam should be protected against erosion.
4. Remove the trees growing from the right side training wall of the spillway and repair the wall.

b. Operation and Maintenance Procedures

1. An operation and maintenance program should be developed and implemented. This program should include periodic operation of outlet works, routine maintenance tasks, and an annual inspection performed by a licensed professional engineer, experienced in the design and construction of dams.
2. A monitoring and downstream warning plan should be developed and implemented during periods of extreme rainfall so that downstream residents and the appropriate agencies are notified in case of an impending dam failure.

O'BRIEN & GERE ENGINEERS, INC.



John J. Williams
John J. Williams, P.E.
Vice President
Pennsylvania Registration No. PE006920E

Date: *21 Aug. 1981*

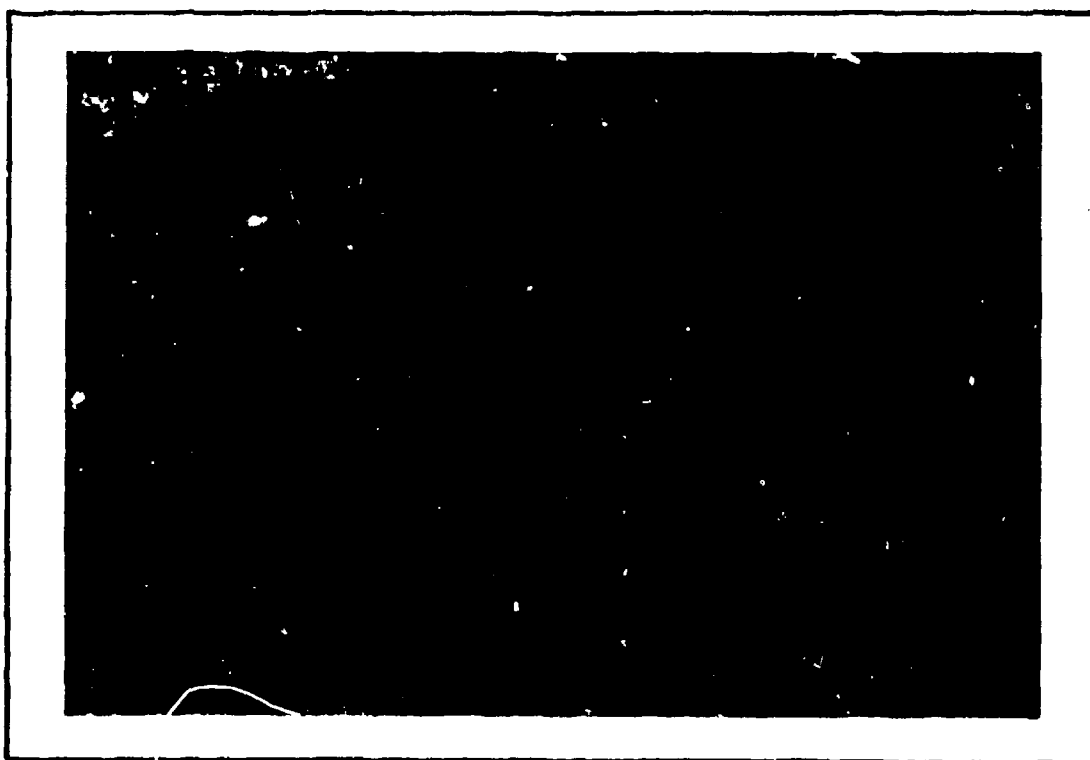
Approved by:

James W. Peck
JAMES W. Peck
Colonel, Corps of Engineers
District Engineer

Date: *31 Aug, 81*



UPSTREAM OVERVIEW FROM RIGHT ABUTMENT. (5/13/81)



DOWNSTREAM OVERVIEW FROM TOE OF DAM. (5/13/81)

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
HUNTER LAKE DAM
NDI ID PA 00774
PA DER 45-136

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if Hunter Lake Dam constitutes a hazard to human life or property.

1.2 Description of Project (Based on information obtained from the Pennsylvania Department of Environmental Resources (DER), Division of Dam Safety, Harrisburg, Pennsylvania, and from the field inspection).

a. Dam and Appurtenances. Hunter Lake Dam is an earth embankment about 300 feet long with a maximum height of approximately 13 feet. According to a section drawing of the dam, a sheet timber core wall extends from an estimated 4 feet below the original ground in hard pan to the top of the dam. An ungated concrete overflow spillway, 57 feet long, is located adjacent to the right abutment of the embankment.

The dam, which is located at the northeastern end of the impoundment, has a varying crest width which averages about 42 feet. The approximate upstream and downstream slopes of the embankment are 1H:1V and 2H:1V, respectively, although the slope is very irregular.

The concrete spillway has a reverse curve downstream face and a vertical upstream face except for the top foot which is on a 1H:1V slope. The crest of the spillway is approximately 3 feet below the top of the dam. A riprapped splash basin extends about 45 feet downstream of the spillway.

b. Location. Hunter Lake Dam is located on Rocky Run in Monroe County, Jackson Township, Pennsylvania. The dam and impoundment are shown on USGS Quadrangle Sheet titled "Mount Pocono, PA" at coordinates N 41° 00.5', W 75° 18-5', approximately two miles west of Bartonsville, Pennsylvania. A regional location plan of Hunter Lake Dam is included as Figure 1, Appendix E of this report.

c. Size Classification. The maximum height of Hunter Lake Dam is 13 feet and the maximum reservoir storage at the low point of the top of the dam is 126

acre feet. The dam is therefore classified as a "Small" size dam (height less than 40 feet and storage less than 1,000 acre feet).

d. Hazard Classification. One home, which would be affected by the failure of the dam, is located approximately 1,500 feet downstream of the dam. The lower level of the home, which is used as a garage and work shop, has a door sill 4 feet above the streambed. A lake and recreation area is also located in this area. Therefore, the dam is classified as a "Significant" hazard structure due to the potential for the loss of a few lives and appreciable property damage.

e. Ownership. The dam is owned by the Golden Slipper Square Club. All correspondence should be directed to: Golden Slipper Square Club, Camp Office, 1315 Walnut Street - Suite 1005, Philadelphia, PA 19107, Attention: Mr. Michael P. Schwartz.

f. Purpose of Dam. The dam was constructed to provide a lake for recreational purposes and is currently being used for this purpose.

g. Design and Construction History. The dam was designed by Mr. John F. Seem, C.E., in 1928. The permit application, design drawings and specifications are available from the Pennsylvania DER. The dam was completed in December of 1928. A bridge was constructed over the spillway in 1929 and was subsequently removed. The original owner was Mr. William T. Hunter and the contractor was Mr. Joseph E. Nyce.

According to the present caretaker, Mr. William C. Bloss, in 1971 the crest was widened and the spillway was repaired. The bridge to the reservoir drain inlet structure and the inlet structure apparently were removed at this time. Presently, it is not possible to draw the reservoir down.

h. Normal Operating Procedures. No reservoir drain gate and operator exist; therefore, no operating procedures exist for the site.

1.3 Pertinent Data

a. Drainage Area.

Square Miles	2.1
--------------	-----

b. Discharge at Dam Site (cfs).

Maximum Spillway Capacity (El. 837.9, Low Point Top of Dam)	985
---	-----

c. Elevations (Feet above MSL).

Top of Dam (Low Point)	837.9
Normal Pool	835.0
Spillway Crest	834.9
Streambed at Dam (Downstream toe)	824.9
Pipe Invert (Reservoir Drain)	824.9

d. Reservoir Length (Feet).

Normal Pool, Elev. 835.0	2,000
Maximum Pool, Elev. 837.9	2,500

e. Reservoir Storage (Acre-Feet).

Normal Pool, Elev. 835.0	57
Maximum Pool, Elev. 837.9	126

f. Reservoir Surface (Acres).

Normal Pool, Elev. 835.0	17
Maximum Pool, Elev. 837.9	31

g. Dam Data.

Type	Earth Embankment
Length	300 feet
Height	13 feet
Top Width	± 42 feet
Side Slopes (Upstream)	1H:1V
(Downstream)	Variable, averages 2H:1V
Zoning	None, homogeneous clayey soil
Impervious Core	Sheet timber into hardpan foundation
Foundation Treatment	None

h. Diversion System.

None

i. Spillway.

Type	Concrete Overflow
Length	57 feet
Height	3 feet
Control	None
Energy Dissipator	None
Downstream Channel	± 45-foot long riprapped splash basin to excavated channel thru natural stream

j. Outlet Works.

Size	30-inch diameter
Invert	824.9
Description	Concrete Pipe
Control Mechanisms	Unknown-Original control no longer exists

SECTION 2

ENGINEERING DATA

2.1 Design

a. Data Available. The engineering data provided by the Pennsylvania DER consist of the following drawings:

1. Rocky Run Dam Reservoir Plan (1928)
2. Rocky Run Dam Location Plan (1928)
3. Rocky Run Dam General Plan (Revised 1929)
4. Rocky Run Dam Cross-Sections & Details (1928)
5. Rocky Run Dam Longitudinal Section (Revised 1929)

Drawings 3, 4 and 5 appear as Sheets 2 through 4 in Appendix E of this report.

b. Design Features. The design features are described in Section 1.2.a and are shown on the drawings in Appendix E.

2.2 Construction

According to correspondence and dam inspection reports provided by the Pennsylvania DER, the dam was originally constructed in 1928. A bridge built over the spillway in 1929 was later removed. In 1971 the crest was widened, repairs were made to the spillway and the reservoir drain inlet structure access bridge and inlet structure were removed.

2.3 Operational Data

No operational data are available for the dam.

2.4 Evaluation

a. Availability. All data utilized in this report were provided by the Pennsylvania DER and supplemented by conversations with the Owner's representative.

b. Adequacy. The information provided by the Pennsylvania DER, conversations with the Owner's representative and observations made during the field investigation provided adequate data for a Phase I evaluation.

c. Validity. There appears to be no reason to question the validity of the limited data available.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. At the time of the inspection on May 13, 1981, the water surface was approximately three feet below the crest of the dam. No underwater areas were inspected. The observations and comments of the field inspection team are presented in Appendix A of this report.

The appearance of the facility indicates that the dam and appurtenances receive limited maintenance.

b. Dam. (Left and right hand designations are referenced looking downstream).

The upstream face of the dam has a slope of approximately 1H:1V. Some evidence of slope erosion, possibly due to wave action, is apparent about 100 feet from the left abutment. No embankment protection is present on the upstream face. A number of trees, with trunks about 3 inches in diameter, are located on the upstream face across the length of the crest.

The crest of the dam is covered with grass. No signs of settlement or misalignment were observed in the embankment. A survey along the centerline of the crest of the dam was made by the inspection team and is shown in Appendix A, Sheet 11B.

The downstream face of the embankment has a slope of approximately 2H:1V. Most of the downstream face of the dam is covered with trees ranging up to 10 inches in diameter. The embankment is very irregular with many boulders along the face. Seepage (2 gpm) was observed at the toe of the dam, approximately 5 feet to the right of the reservoir drain outlet pipe. Although no water appeared to be flowing from the reservoir drain pipe, the sound of rushing water could be heard within it.

c. Appurtenant Structures. The concrete spillway is located adjacent to the right abutment of the dam. The concrete appears to be in good condition. No settlement was observed in the spillway. The approximately 45-foot long spillway splash basin has several trees and brush growing in its center, approximately 20 feet downstream of the spillway.

Several trees are growing on the right side training wall of the spillway. Several of the trees are growing between the stones of the wall forcing them apart. The remnants of the intake for the reservoir drain are submerged and could not be appraised. The outlet of the reservoir drain has about 6 inches of tailwater in it.

d. Reservoir. The slopes adjacent to the impoundment are moderate and covered with trees. No evidence of slope instability was observed.

e. Downstream Channel. The spillway outlet chute discharges into the natural channel an estimated 200 feet downstream of the dam. The channel is about 10 feet wide with approximately 2H:1V side slopes which are about 2 feet high, and the average channel slope is about 2 percent. One house, with the door sill to the garage and work room area approximately 4 feet above the streambed, is located approximately 1,500 feet downstream of the dam.

3.2 Evaluation

Based on visual observations, the dam and appurtenances appear to be in fair condition. Recommendations and remedial measures are presented in Section 7.2 of this report.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures

According to the Owner's representative, no written operational procedures exist for the dam. The impoundment is maintained at the normal pool for recreational purposes.

4.2 Maintenance of the Dam

According to the Owner's representative, no written maintenance procedures for the dam exist. Maintenance is performed on an as needed basis.

Based on the visual inspection, the only regularly scheduled maintenance appears to be the cutting of the grass on the dam crest.

4.3 Maintenance of Operating Facilities

According to the Owner's representative, a new 16-inch diameter drain pipe was installed in 1971 with a wooden plug at the upstream end. At the time of the inspection, no evidence of this pipe or of a control valve were evident.

4.4 Description of Any Warning System in Effect

According to the Owner's representative, no formal warning system or procedures are established for monitoring the structure during periods of heavy rainfall or in the event of impending dam failure; however, the caretaker for the camp monitors the dam during intense rainfall and he would personally notify the residents living downstream of the dam in the event of an impending failure.

4.5 Evaluation

Periodic inspection of the dam and appurtenances should be made by a qualified engineer. A gate should be installed on the drain pipe so that the reservoir can be drawn down.

A formal maintenance program for the dam and appurtenances should be developed and implemented. Records of maintenance should be recorded by the Owner. A formal warning system relative to the houses downstream of the dam must be developed.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features

a. Design Data. The drainage area for Hunter Lake Dam, as measured from the USGS map, is about 2.1 square miles. The basin has a maximum length of about 2.5 miles and a maximum width of about 1.5 miles. The ground surface elevations vary from about 1130 in the upper reaches of the drainage area to 835 at normal pool. The drainage area is essentially undeveloped forest land, except for the recreational camps around Hunter Lake and the lake at Pinemere Camp about one mile upstream.

b. Experience Data. Rainfall and spillway discharge records are not maintained by the Owner. According to the Owner's representative, the highest the reservoir has been in the past 10 years was approximately two feet below the crest of the dam.

c. Visual Observation. The spillway appears to be operating adequately; however, the discharge capacity may be affected by the trees and brush located in the spillway discharge channel.

d. Overtopping Potential. The recommended Spillway Design Flood (SDF) for a "Small" size, "Significant" hazard dam ranges from the 100 year flood to one-half of the Probable Maximum Flood (PMF). The SDF selected for the analysis of Hunter Lake Dam is the 100 year flood because of the potential for appreciable damage to only one house at the damage center in the event of a dam failure. The chance for the loss of human life in the event of a dam failure is low.

The peak SDF flow is 1333 cfs and the maximum spillway discharge at the low point of the top of the dam is 985 cfs.

e. Spillway Adequacy. The Hunter Lake Dam spillway is classified as "Inadequate" since it is not capable of passing the SDF.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The overall structural appearance of the dam at the time of the inspection was fair. The source of the seepage (2 gpm) observed at the downstream toe of the dam should be monitored. The irregularity of the downstream face of the dam appears to be the result of poor construction control during the widening of the crest in 1971. No cracking in the embankment was noted.

Based on visual observations, the embankment appears to be stable under static loading conditions.

b. Design and Construction Data. Drawings for the original dam are included in Appendix E. No drawings are known to exist relative to the modifications in 1971.

c. Operating Records. According to the Owner's representative, operating records are not maintained for this dam.

d. Post Construction Changes. According to the Owner's representative, the crest of the dam was widened to 42 feet and the spillway was repaired in 1971. The bridge to the reservoir drain inlet structure and the inlet structure apparently were removed at this time.

e. Seismic Stability. Hunter Lake Dam is located in Seismic Zone 1 as shown on the Seismic Zone Map of Contiguous States. A dam located in Seismic Zone 1 is considered to be safe under any expected Zone 1 earthquake loading conditions if it is stable under static loading conditions.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation. Based on the visual observations and a review of the available information, Hunter Lake Dam is considered to be in fair condition. Several deficiencies were noted during the inspection.

Many trees are growing on the upstream and downstream faces of the embankment. Intermittent riprap slope protection exists on the upstream face of the dam. Some sloughing and settlement of the upstream slope has occurred. Evidence exists of seepage (2 gpm) approximately 5 feet to the right of the reservoir drain outlet pipe and the ground in this area is soft and swampy.

The spillway appears to be in good structural condition, but the stone masonry training wall on the right side has trees growing from it, which in some cases have dislodged stones. The spillway discharge channel has trees and brush in the center of the channel beginning about 20 feet downstream of the spillway.

Hunter Lake Dam is a "Small" size, "Significant" hazard structure. The SDF selected is the 100 year flood. The peak SDF flow is 1333 cfs. The maximum spillway discharge at the low point of the top of the dam is 985 cfs. The spillway is, therefore, classified as "Inadequate".

b. Adequacy of Information. The information obtained from the Pennsylvania DER, visual observations and discussions with the Owner's representative are considered adequate for a Phase I investigation.

c. Urgency. The remedial measures recommended in Section 7.2 should be initiated immediately.

d. Necessity for Further Investigation. Further investigation should be implemented as discussed in Section 7.2.

7.2 Recommendations and Remedial Measures

The following recommendations and remedial measures should be initiated immediately.

a. Facilities

The Owner should retain the services of a licensed professional engineer experienced in the design and construction of dams to assist in the implementation of the following recommendations:

1. Provision should be made for reservoir drawdown and the condition of the existing reservoir drain should be investigated.

2. Suitable upstream slope protection should be established and maintained.

3. Measures should be taken to increase the spillway capacity to pass the 100 year flood.

The Owner should initiate the following remedial measures:

1. The upstream face and crest of the embankment should be cleared of all trees.

2. The seepage at the downstream toe of the embankment should be observed regularly for indications of a change in flow rate and/or turbidity.

3. The downstream face of the dam should be protected against erosion.

4. Remove the trees growing from the right side training wall of the spillway and repair the wall.

b. Operation and Maintenance Procedures

1. An operation and maintenance program should be developed and implemented. This program should include periodic operation of outlet works, routine maintenance tasks, and an annual inspection performed by a licensed professional engineer, experienced in the design and construction of dams.

2. A monitoring and downstream warning plan should be developed and implemented during periods of extreme rainfall so that downstream residents and the appropriate agencies are notified in case of an impending dam failure.

APPENDIX A
INSPECTION CHECKLIST

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Hunter Lake Dam County Monroe State Pennsylvania National ID # PA 00774
Type of Dam Earth Embankment Hazard Category Significant
Date(s) Inspection 5/13/81 Weather Sunny (5/13/81) Temperature 72° (5/13/81)
6/2/81

Pool Elevation at Time of Inspection +835 M.S.L. Tailwater at Time of Inspection +825 M.S.L.
(5/13/81) (5/13/81)

Inspection Personnel:

L. Beck

M. A. Goldstein

R. E. Horvath

L. H. DeHeer (6/2/81)

J. Rauschkolh

M. A. Goldstein

Recorder

Remarks:

The inspection team was accompanied by Mr. William Bloss, the caretaker of the Golden Supper Square Club Camp.

(5/13/81)

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
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SURFACE CRACKS	None observed.	
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UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Downstream face was irregular with several large boulders along face.	This condition appears to be a result of the widening of the crest in 1971.
---	---	---

SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Some evidence of erosion or settlement along upstream face approximately 100 feet from the left abutment due to wave action.	Provide some means of slope protection.
--	--	---

VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The horizontal and vertical alignment of the crest appears to be good. The design top of dam is Elev. 838.00.	
--	---	--

RIPRAP FAILURES	Riprap is evident only in isolated location on the upstream face of the dam.	On the 1928 construction drawing, riprap was shown on both the upstream and downstream faces of the embankment. Consideration should be given for placing riprap on the upstream face of the dam to protect against wave action.
-----------------	--	--

EMBANKMENT

Sheet 5 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Many trees are growing on the upstream and downstream embankment slopes.	Trees should be removed and grass should be planted and maintained on the embankment slopes.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The downstream slope in the vicinity of the spillway is about 3H:1V extending for 20 feet from the abutment. Rocks have been dumped on the upstream face at the junction of the spillway and right abutment, and large rock outcrops were noted at the left abutment upstream and downstream.	
ANY NOTICEABLE SEEPAGE	Seepage (2gpm) was noted at the downstream toe of the dam approximately 5 feet to the right of the 30-inch diameter reservoir drain pipe.	An investigation should be made of the source and nature of the seepage.
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The conduit is constructed through the base of the embankment. Only a few feet of the conduit could be ob- served at the downstream outlet end. This portion of the pipe appeared to be in satisfactory condition.	General Comment Outlet Works: The reservoir drain system should be rehabilitated.
INTAKE STRUCTURE	Remnants are submerged and could not be inspected. Access bridge has been removed.	
OUTLET STRUCTURE	No outlet structure attached to pipe.	
OUTLET CHANNEL	Poorly defined channel for approxi- mately 200 feet which discharges into natural channel.	
EMERGENCY GATE	Reservoir drain gate was removed in 1971.	

UNGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Good condition, little evidence of pitting. The horizontal and vertical alignment is good.	
APPROACH CHANNEL	No approach channel exists. Water discharges directly from the reservoir.	
DISCHARGE CHANNEL	The riprapped splash basin which extends about 45 feet downstream of the spillway effectively carries flow away from the toe area of the spillway. The training wall along the right side of the spillway has trees growing from it and mortar has fallen out of the joints. Brush and trees are growing in splash basin.	The trees should be removed and training wall repaired. Brush and trees should be removed from the splash basin.
BRIDGE AND PIERS	None observed.	

GATED SPILLWAY

Sheet 8 of 11	
VISUAL EXAMINATION OF	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A
APPROACH CHANNEL	N/A
DISCHARGE CHANNEL	N/A
BRIDGE AND PIERS	N/A
GATES AND OPERATION EQUIPMENT	N/A

INSTRUMENTATION

Sheet 9 of 11	
VISUAL EXAMINATION	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed.
OBSERVATION WELLS	None observed.
WEIRS	None observed.
PIEZOMETERS	None observed.
OTHER	None.

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES

Slopes averaged 5-10%.
Trees are growing to the waters
edge on the entire perimeter of the
reservoir.

SEDIMENTATION

No evidence of excessive sedimentation
was observed in the impoundment.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Immediately downstream of the spillway brush and trees are growing in the splash basin. Below the splash basin, the channel is obstructed by boulders and forest debris.	Brush and trees should be removed from the splash basin. Forest debris should be cleared from the channel for a few hundred feet downstream of the dam.
SLOPES	Side channel slopes are approximately 2H:1V. The channel grade averages about 2 percent.	
APPROXIMATE NO. OF HOMES AND POPULATION	Only one residence about 1,500 feet downstream was found to be in a potentially hazardous location. The door sill to the garage and work room area is about 4 feet above the stream-bed.	



O'BRIEN & GERE

SUBJECT

HUNTER LAKE DAM

SHEET

11A

BY

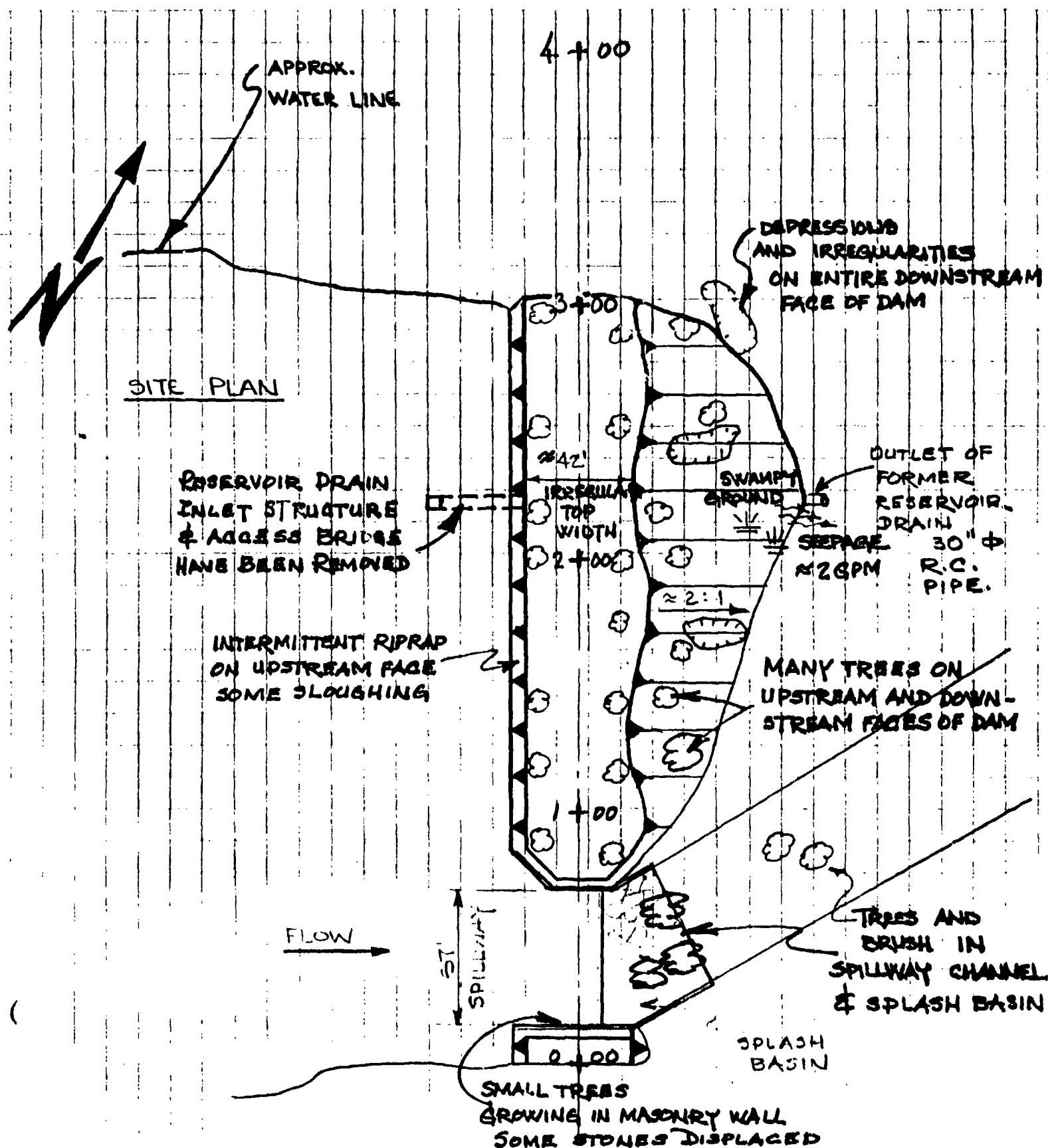
MAG

DATE

5-22-81

JOB NO

1841-.014





O'BRIEN & GERE

SUBJECT

HUNTER LAKE DAM

SHEET

11B

BY

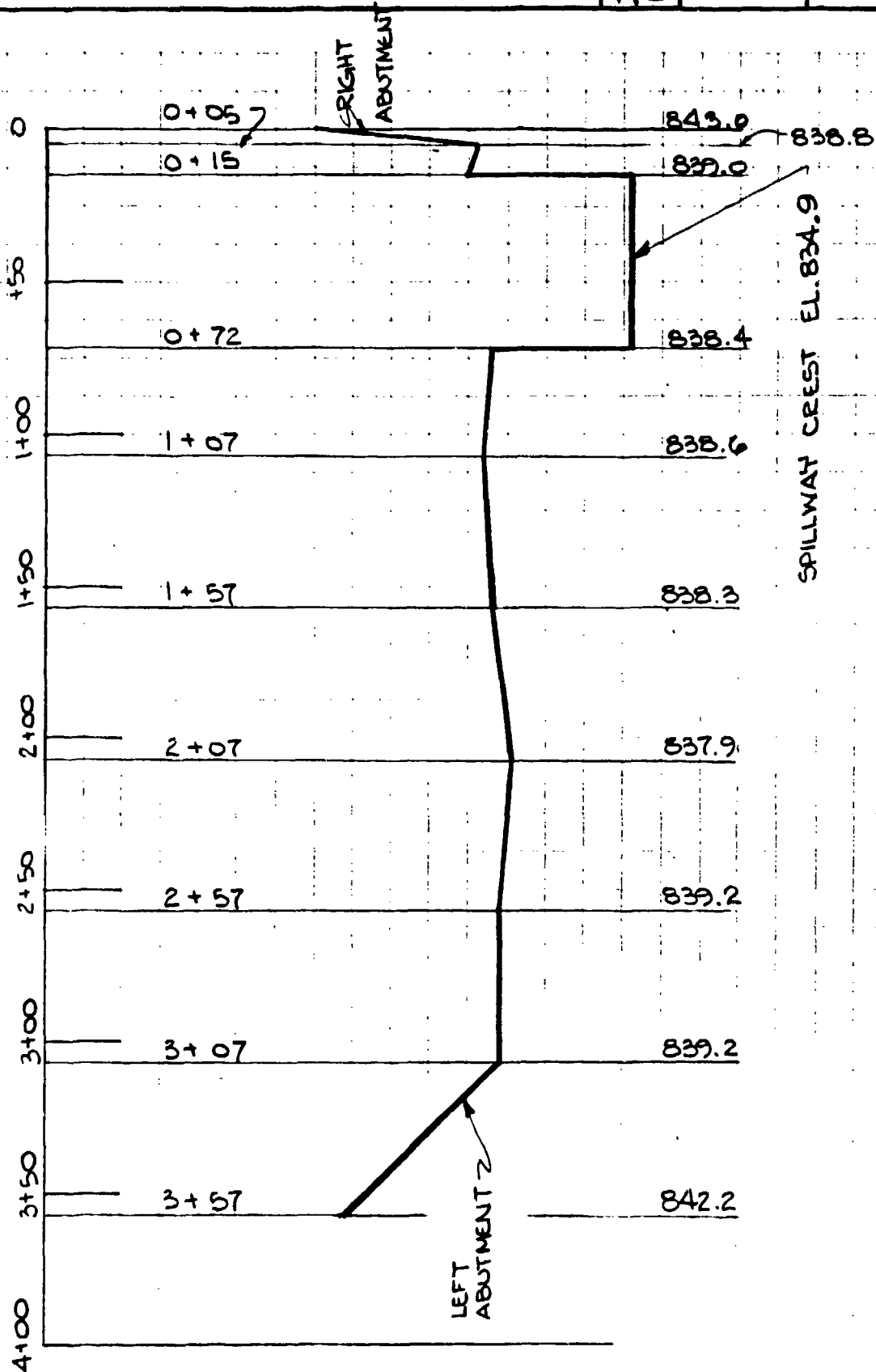
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DATE

5-19-81

JOB NO

1841-.014



PROFILE CENTERLINE TOP OF DAM
LOOKING DOWNSTREAM

SCALE: 1" = 50' HORIZ.

1" = 4' VERT.

DATE OF SURVEY 5/13/81

APPENDIX B
CHECKLIST
ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Hunter Lake Dam
ID # PA 00774

Sheet 1 of 4

ITEM

REMARKS

AS-BUILT DRAWINGS

Refer to Appendix E, Figures 2-4.

REGIONAL VICINITY MAP

Refer to Appendix E, Figure 1.

CONSTRUCTION HISTORY

Refer to Section 1.2.g.

TYPICAL SECTIONS OF DAM

Refer to Appendix E.

OUTLETS - PLAIN

DETAILS

Refer to Appendix E.

CONSTRAINTS

None available.

DISCHARGE RATINGS

None available.

RAINFALL/RESERVOIR RECORDS

Rainfall/reservoir records are not maintained by the owner.

Sheet 2 of 4

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	No information available.

ITEM	REMARKS
MONITORING SYSTEMS	None observed.
MODIFICATIONS	<ol style="list-style-type: none"> 1. Crest widened on 1971 from 8' to approximately 42'. 2. The reservoir drain was blocked of in 1971.
HIGH POOL RECORDS	Records are not maintained by owner.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	No maintenance records are kept.

Sheet 4 of 4

ITEM	REMARKS
SPILLWAY PLAN	Refer to Appendix E.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	None available.
MISCELLANEOUS	

APPENDIX C
PHOTOGRAPHS

APPENDIX C
PHOTOGRAPH TABLE OF CONTENTS

	<u>Page No.</u>
Site Plan	A
<u>PHOTOGRAPH</u>	
<u>No.</u>	
1. View along top of dam from the left abutment. (5/13/81)	1
2. View of the reservoir from the top of the dam. (5/13/81)	1
3. Spillway and training wall at the right abutment. (5/13/81)	2
4. Spillway with trees in discharge chute. (5/13/81)	2
5. Outlet pipe. (5/13/81)	3
6. Seepage approximately 5 feet to the right of outlet pipe. (5/13/81)	3
7. Potential damage area about 1500 feet downstream of the dam. (5/13/81)	4



O'BRIEN & GERE

SUBJECT

HUNTER LAKE DAM

SHEET

A

BY

MAG

DATE

5.22.81

JOB NO.

1841 - .014

SITE PLAN

IMPOUNDMENT

LEGEND



THE LOCATION AND DIRECTION
IN WHICH EACH PHOTO WAS
TAKEN AND THE NUMBER OF
THE PHOTO.

SPILLWAY

①

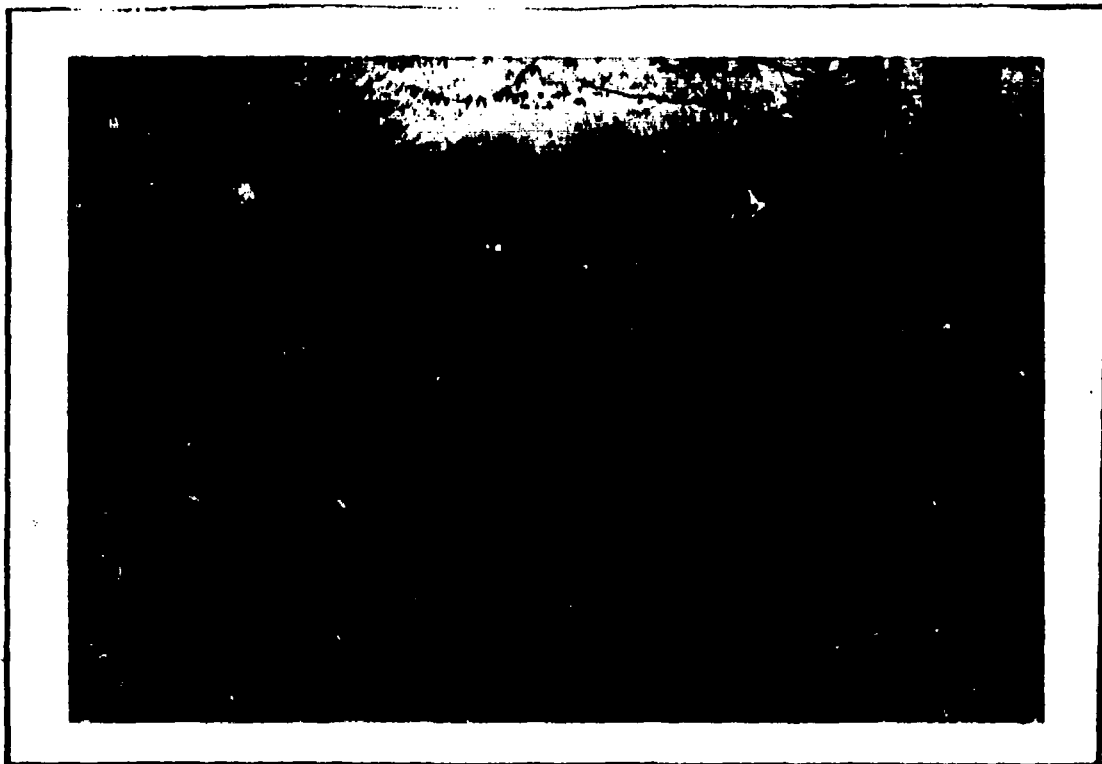
②

④

③

⑥

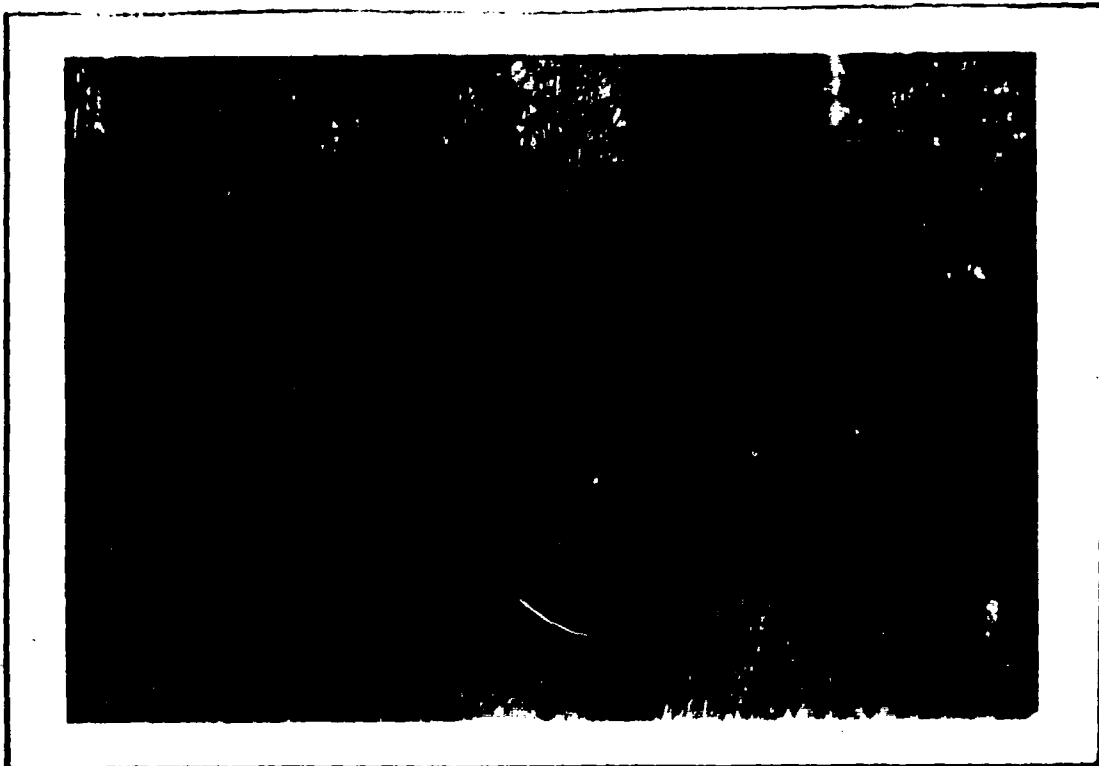
⑤



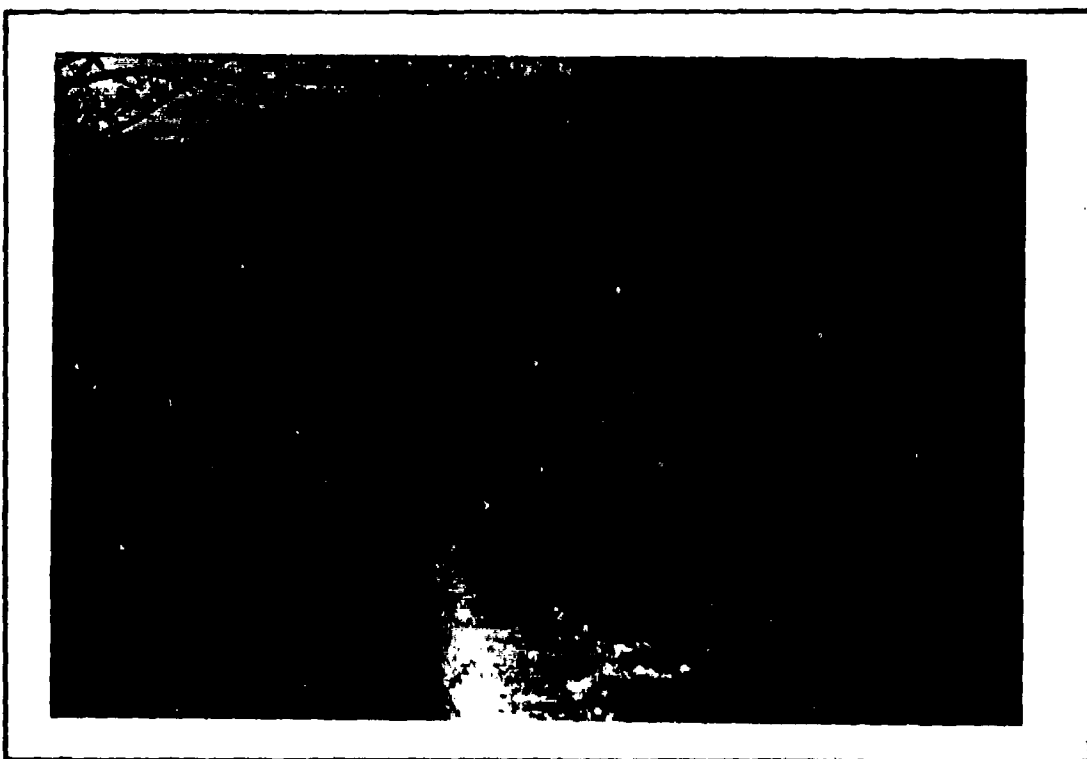
1. VIEW ALONG TOP OF DAM FROM THE LEFT ABUTMENT. (5/13/81)



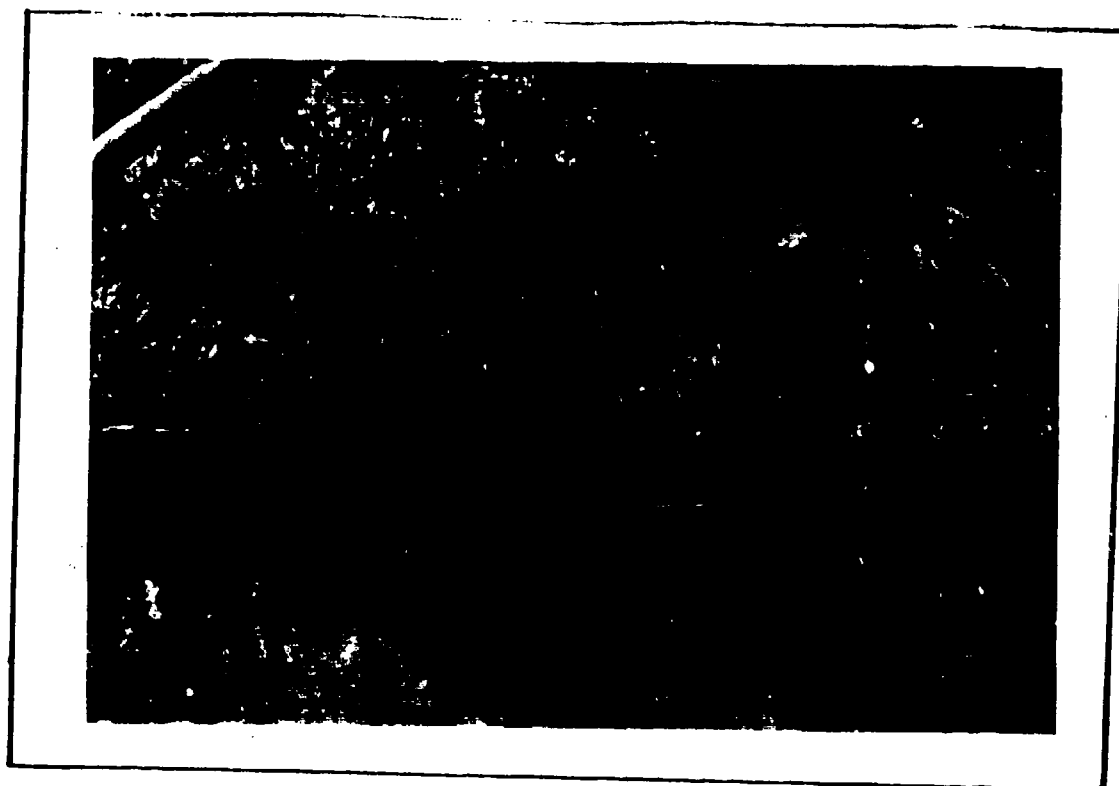
2. VIEW OF THE RESERVOIR FROM THE TOP OF THE DAM. (5/13/81)



3. SPILLWAY AND TRAINING WALL AT THE RIGHT ABUTMENT. (5/13/81)



4. SPILLWAY WITH TREES IN DISCHARGE CHUTE. (5/13/81)



5. OUTLET PIPE. (5/13/81)



6. SEEPAGE APPROXIMATELY 5 FEET TO THE RIGHT OF OUTLET PIPE.
(5/13/81)



7. POTENTIAL DAMAGE AREA ABOUT 1500 FEET DOWNSTREAM OF THE DAM. (5/13/81)

APPENDIX D
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

O'BRIEN & GERE

HUNTER LAKE DAM
APPENDIX D
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

TABLE OF CONTENTS

	<u>Sheet No.</u>
Check List Hydrologic & Hydraulic Engineering Data.	1
Drainage Area, Stage-Area, Stage-Storage & Storage-Discharge Calculations	2
Peak Inflow, Q100 for 100 Year Flood	3 & 4

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATADRAINAGE AREA CHARACTERISTICS: RURAL - FORESTEDELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 835 MSL (57 ACRES-FEET)ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N/AELEVATION MAXIMUM DESIGN POOL: N/AELEVATION TOP DAM: 837.9 MSL (LOW POINT TOP OF DAM)

SPILLWAY

a. Elevation 835 MSLb. Type ROUNDED CONCRETE OVERFLOWc. Width 3 FEET INCLUDING ROUNDED PORTIONd. Length 57 FEETe. Location Spillover RIGHT ABUTMENTf. Number and Type of Gates NONE

OUTLET WORKS:

a. Type 30" ϕ CONCRETE PIPEb. Location THROUGH BASE OF EMBANKMENTc. Entrance inverts UNKNOWNd. Exit inverts 824.9 MSLe. Emergency drawdown facilities NONE

HYDROMETEOROLOGICAL GAGES:

a. Type ONE WITHIN DRAINAGE BASINb. Location N/Ac. Records N/AMAXIMUM NON-DAMAGING DISCHARGE: NOT DETERMINED



O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO.
Hunter Lake Dam	2	JB	8/13/61	1841-014

Drainage Area (Planimetered from USGS Quad. sh.) = 2.1 mi²

Stage - Area & Stage - Storage Calculations

El. (Feet Above MSL)	Area (Acres)	Volume ¹ (A-F) Total
825.0	0	
835.0 (Normal Pool From Orig. Dwg.)	17	57
837.9 (Low Pt. Top Dam)	31	126
840.0	41	202

¹ Computed using $V = \frac{H}{3}(A_1 + A_2 + \sqrt{A_1 \times A_2})$
For each increment

Stage - Discharge Calculations

$$Q = CLH^{3/2}$$

For Ogee spuy. assume $C \approx 3.5$
 $L = 57'$

At Low Pt. Top of Dam, El. 837.9

$$Q = 3.5 \times 57 \times 2.9^{3/2}$$

$Q \approx 765$ cfs. < 1333 cfs. Peak Inflow Q_{100} (Refer to sk. 7)

∴ The spillway is "Inadequate" because it can not pass the 100 yr. flood.

SUBJECT

HUNTER LAKE DAM

SHEET

3

BY

MAG

DATE

5-20-81

JOB NO

1841-.014

✓ 6/6/81

PEAK INFLOW, Q_{100} , FOR 100 YR FLOOD

Reference: Water Resources Bulletin No. 13, "Floods in Pennsylvania", October 1977.

Drainage basin is in Region 5

Model 5

$$Q_T = CA^x P_L^y$$

$$Q_{100} = 42.2 A^{.751} P_L^{.744}$$

$$P_L = 49 \text{ in (Plate 2)}$$

$$A = 2.1 \text{ sq. mi}$$

$$Q_{100} = 42.2 (2.1)^{.751} (49)^{.744}$$

$$Q_{100} = \underline{1333 \text{ cfs}}$$



O'BRIEN & GERE

SUBJECT

HUNTER LAKE DAM

SHEET

4

BY

MAG

DATE

5.20.81

JOB NO

1841-.014

✓ 6/15/81

PEAK INFLOW, Q_{100} , FOR 100 YR. FLOOD (CONT'D.)

Reference: Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District, C.O.E., November 1974.

$$\log(Q_m) = C_m + 0.87 \log(A)$$

$$S = C_s - 0.05 \log(A)$$

$$\log(Q_{100}) = \log(Q_m) + KS$$

$$C_m = 1.7 \quad (\text{Fig. 2})$$

$$C_s = 0.367 \quad (\text{Fig. 3})$$

$$g = +0.8 \quad (\text{Fig. 5}) \quad \therefore K = 2.89 \quad (\text{Introduction to Hydrology, Table C-2, Appendix C, Page 68})$$

$$\log(Q_m) = 1.7 + 0.87 \log(2.1)$$

$$= 1.98$$

$$S = 0.367 - 0.05 \log(2.1)$$

$$= 0.351$$

$$\log(Q_{100}) = 1.98 + 2.89 (0.351) = 2.995$$

$$Q_{100} = 988 \text{ cfs} < 1333 \text{ cfs} \quad (\text{Model S})$$

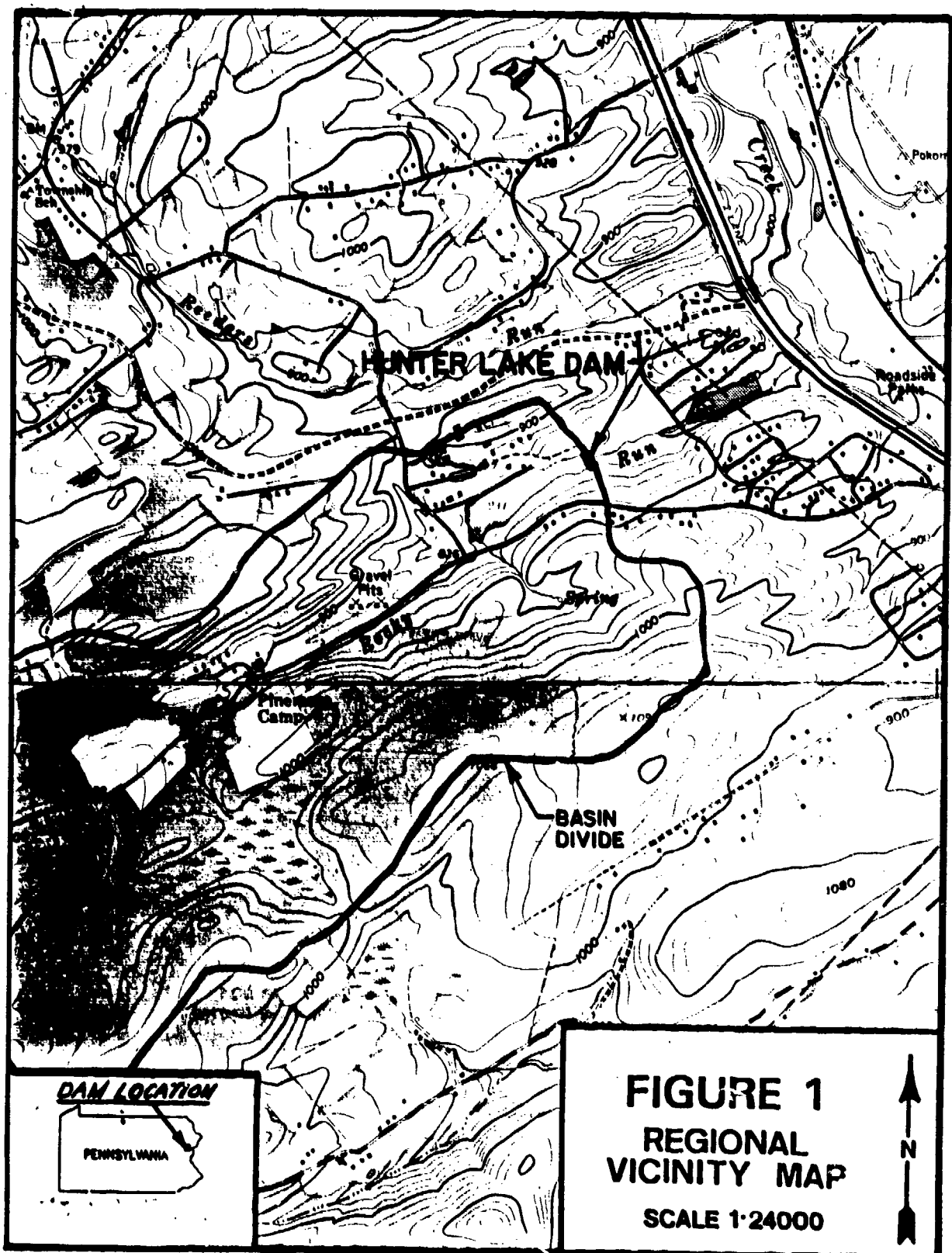
USE 1333 cfs as peak inflow Q_{100}

APPENDIX E
REGIONAL VICINITY MAP
&
DRAWINGS

HUNTER LAKE DAM
APPENDIX E
REGIONAL VICINITY MAP
&
DRAWINGS

TABLE OF CONTENTS

	Sheet No.
Regional Vicinity Map, Figure 1.	1
General Plan of the Dam (1928 Drawing).	2
Longitudinal Section of the Dam (1928 Drawing).	3
Cross-Sections & Details (1928 Drawing)	4



REVISED
GENERAL PLAN
PROPOSED

ROCKY RUN DAM FOR J. E. NYCE AND HERBERT SPRAGLE

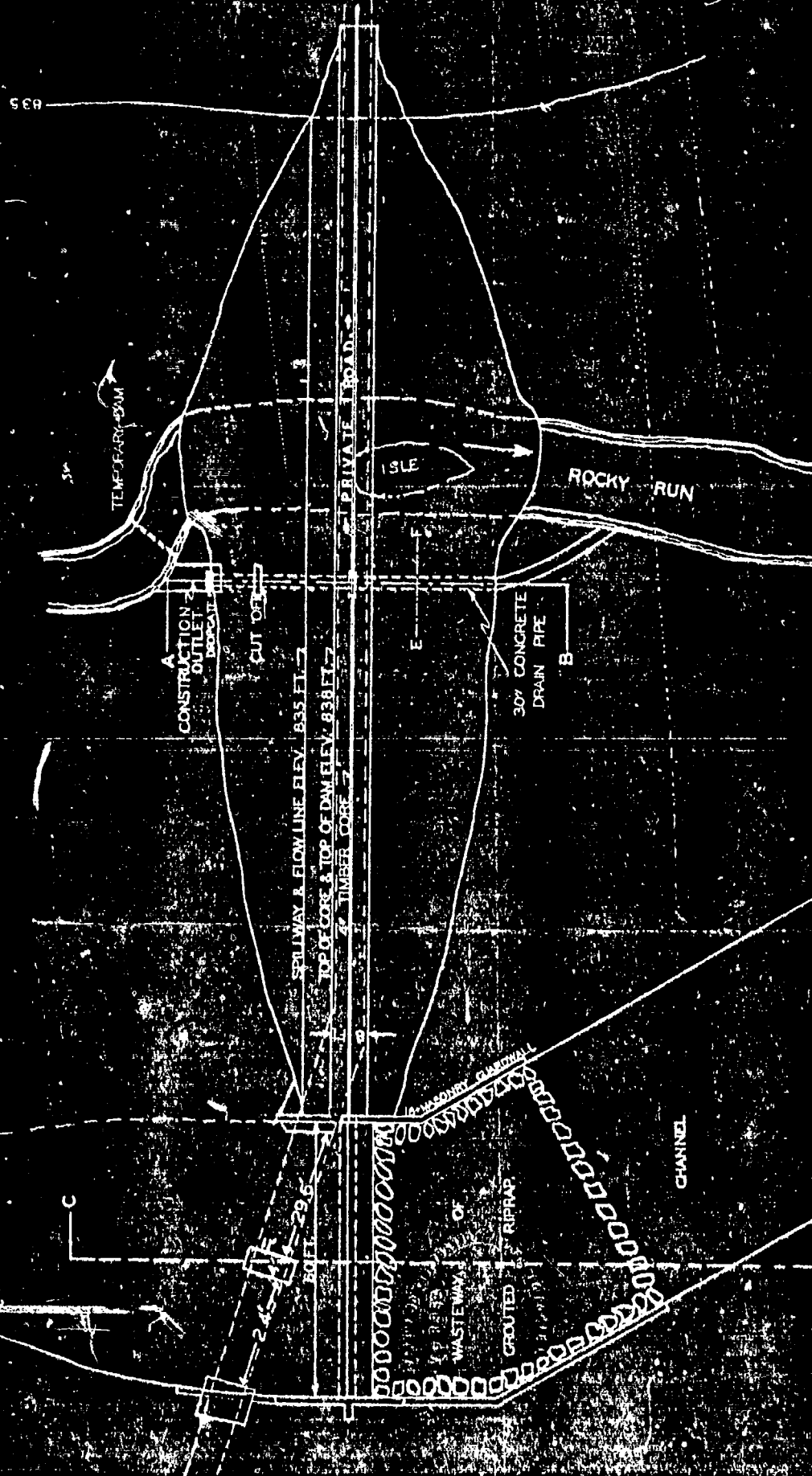
SCALE: 1" = 20 FT. ENGINEER: JOHN F. SEEM, C.E.
TANNERSVILLE, PA.
JUNE 1928.

ASST. ENG. W. H. SEBRING, C.E.

REVISED AUG. 8 1929.

ORIGINAL SPILLWAY AREA — 180 SQ. FT.

REVISED SPILLWAY AREA — 187.6 SQ. FT.



LONGITUDINAL SECTION

PROPOSED

ROCKY RUN DAM

FOR

J. E. NYCE AND HERBERT SPRAGUE

ENGINEER

JOHN F. SEEM, C.E.

TANNERSVILLE, PA.

ASST. ENG. W. H. SEBRING, C.E.

JUNE 1928

SCALE:

VER. — 1" = 40 FT

HOR. — 1" = 40 FT

PIERS

GLUE WALL TOP
ELEV. 839.2

CLAYEY LOAM

CLAY

HARDPAN

5.0 FT

PRESENT TOP OF DAM, ELEV. 838.5

TOP OF DAM AND CORE ELEV. 838 FT

SPILLWAY ELEV. = 835 FT

CLAYEY LOAM

CLAY

HARDPAN

CLAYEY LOAM

CLAY

HARDPAN

ORIGINAL SURFACE

CLAYEY LOAM

CLAY

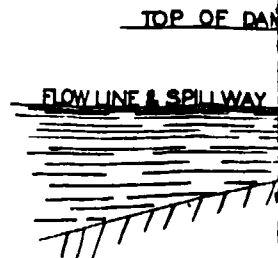
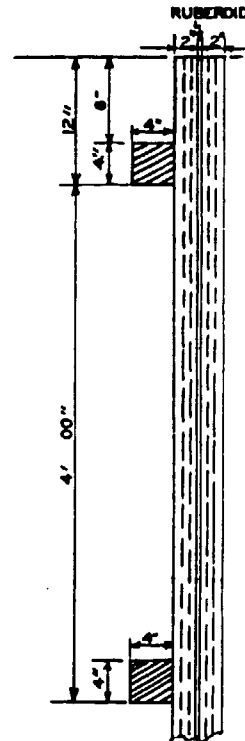
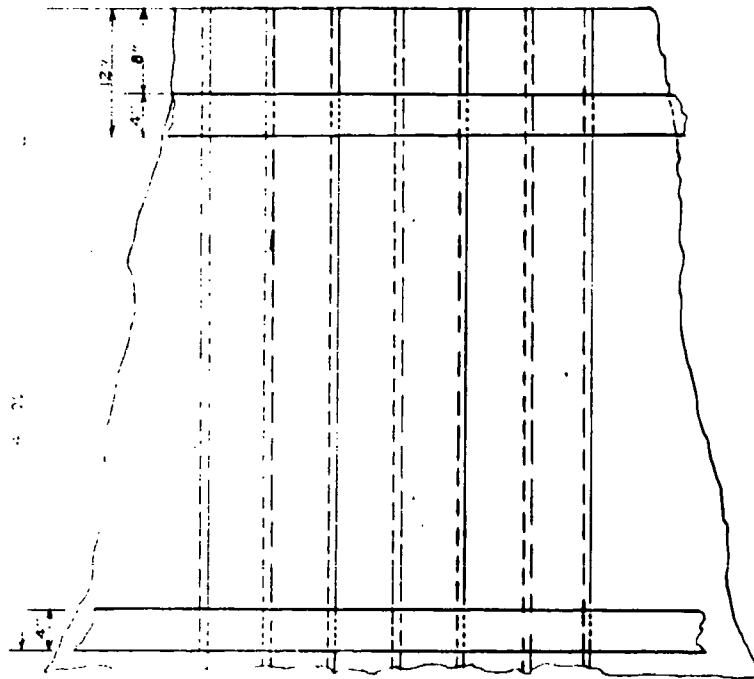
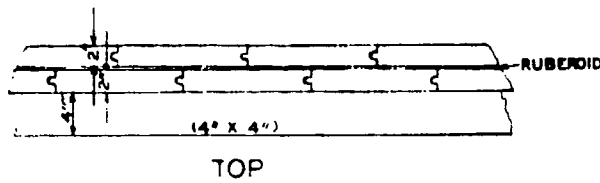
HARDPAN

PROBABLE DEPTH OF
EXCAVATION FOR GORE

RIO. ELEVATION ABOVE MEAN TIDE 810

SHEET 3

TIMBER DETAIL
SCALE: 1" = 1 FT.



ELEV. 838 FT.

12" PLACED RIPRAP

SLOPE 1 ON 2

EARTH FILL OF CLAY

ORIGINAL SURFACE

30" REINFORCED CONCRETE OUTLET PIPE END

CROSS-SECTIONS & DETAILS

PROPOSED

ROCKY RUN DAM

FOR

J. E. NYCE & HERBERT SPRAGLE

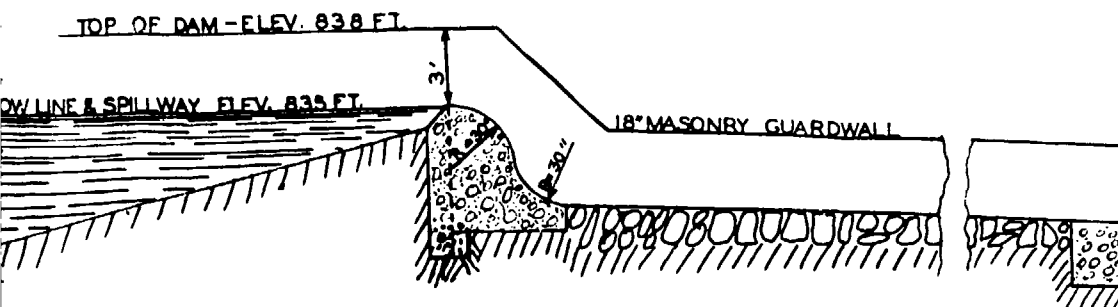
SCALES AS SHOWN. ENGINEER: JOHN F. SEEM, C.E.
JUNE 1928. TANNERSVILLE, PA.

ASST. ENG.: W. H. SEBRING, C.E.

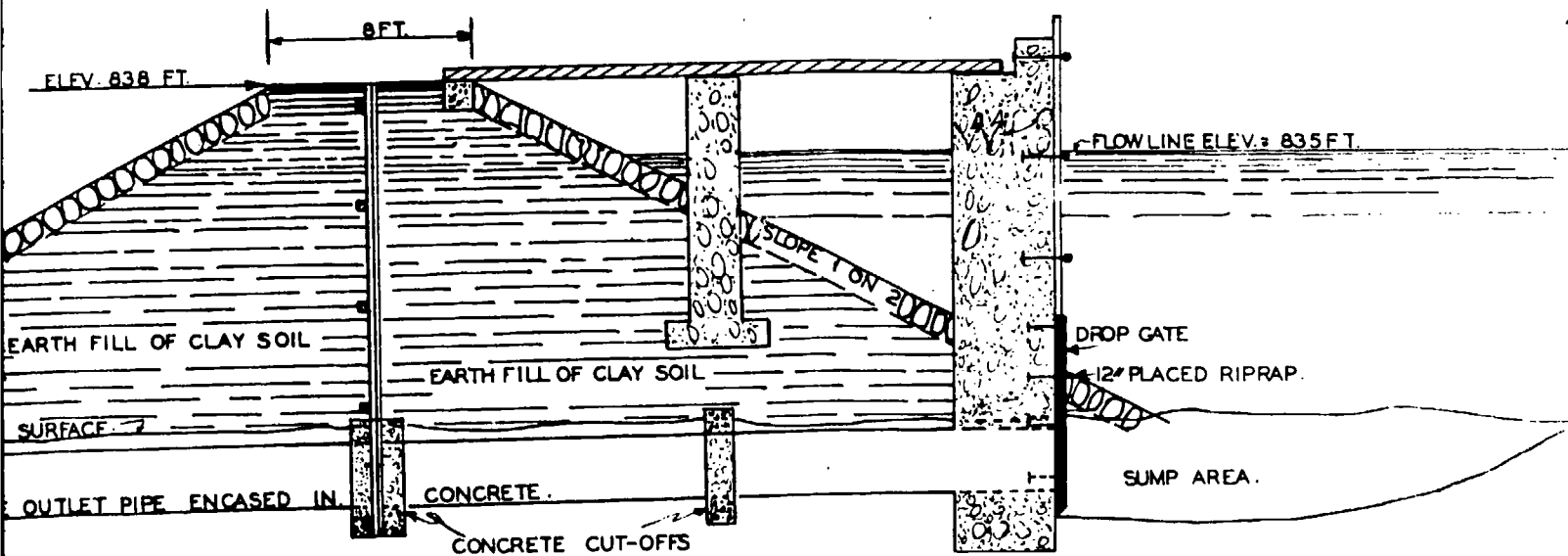
CLAY

HAR

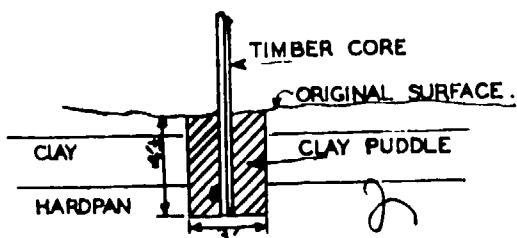
VIEW SHOW



SECTION C-D.
SCALE: 1" = 5 FT.

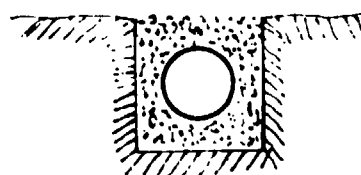


SECTION A-B.
SCALE: 1" = 5 FT.



VIEW SHOWING TIMBER CORE ANCHORAGE IN SECTIONS
OTHER THAN SECTION A-B.

SCALE: 1" = 5'



SECTION E-F
SCALE: 1" = 5 FT.

SHEET 4

APPENDIX F
GEOLOGY

SITE GEOLOGY

HUNTER LAKE DAM

Hunter Lake Dam is located in Monroe County within the Pocono Plateaus section of the Appalachian Plateaus physiographic province. The site is underlain by Devonian age Catskill group continental bedrock units (Analomink and Delaware flag members), consisting of red to brown and gray shale siltstone, sandstone and conglomerate. To the southeast of the site, older Devonian marine beds (Dm) and (Dh) outcrop and dip beneath the Catskill sediments. Both the Catskill and marine beds strike about N.65° E. and dip about 15° NW.

Bedrock in the area is mantled by Wisconsin epoch glacial drift deposits varying in thickness and ranging from very fine sand to boulder sizes.

No major structural deficiencies are noted in the dam area; jointing and fracturing is well defined in the Catskill units giving them an effective porosity. These units are considered to constitute a fair to good ground water aquifer.

